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## Risk Management and Its Application to Air Carrier Safety

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# RISK MANAGEMENT AND ITS APPLICATION TO AIR CARRIER SAFETY

BRENT E. DYER

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## I. INTRODUCTION

ON DECEMBER 20, 1995, American Airlines Flight 965 from Miami crashed into a mountain on its approach to the Cali, Colombia airport.<sup>1</sup> The crash was surprising, especially considering that the pilots were experienced, familiar with the terrain, and flying a relatively new 757.<sup>2</sup> At first, officials suspected the crash might have been the result of a terrorist attack or bombing.<sup>3</sup> As the investigation unfolded, however, it became clear that the cause of Flight 965's crash would be more elusive. When the plane hit the mountain, it was thirteen miles off course.<sup>4</sup> The Colombian government pointed to the course deviation, blaming the accident on pilot error.<sup>5</sup> But some pilots have taken issue with the Colombian report. Two anonymous pilots criticize the report as an attempt to make the dead pilots of Flight 965 into scapegoats. One said that "[t]he controller and pilot didn't understand each other, partly because of language problems . . . [a]nd the controller was giving clearances that made no sense because he had no radar and couldn't see the airplane."<sup>6</sup>

The radar at the Cali airport was blown up by guerrillas in 1991 and was never replaced.<sup>7</sup> Colombian officials have denied

<sup>1</sup> *Tapes Point to Pilot Error in Colombia Jet Crash*, ARIZ. REPUBLIC, Dec. 29, 1995, at A25; Chris Torchia, *Bodies X-Rayed for Clues to Crash; Signs of Shrapnel Sought in Colombia*, L.A. DAILY NEWS, Dec. 24, 1995, at N13.

<sup>2</sup> *Pilots Say Colombian Controllers Misunderstood Location of Flight 965*, RALEIGH N.C. NEWS & OBSERVER, Jan. 3, 1996, at A7.

<sup>3</sup> Torchia, *supra* note 1, at N13.

<sup>4</sup> *Id.*

<sup>5</sup> *Tapes Point to Pilot Error in Colombia Jet Crash*, *supra* note 1, at A25.

<sup>6</sup> *Pilots Say Colombian Controllers Misunderstood Location of Flight 965*, *supra* note 2, at A7.

<sup>7</sup> *Id.*

that the missing radar was an element of the crash. But Hector Facundo, a sixteen-year pilot for Colombian airline Avianca and secretary of the Air Safety Committee of the Colombian Pilots Association, disagrees. "It is clear from the partial transcript of the recordings that [Cali controllers] did not know where the plane was, because they repeatedly asked the pilot to 'report passing Tulua.'"<sup>8</sup>

Whether or not the cause of the crash is ever determined, much can be learned from examining the risks involved in that accident. American Airlines incurred a risk when it continued to fly into an airport with no radar. It incurred a risk when it hired the two pilots that flew the 757. It incurred a risk in the language barrier between the pilots and the Cali ground crew. Every day, thousands of Americans and millions of people worldwide fly on commercial air carriers. Additionally, commercial freight carriers ship billions of dollars worth of goods. As the industry continues to grow, the risk of air crashes will become more frequent. It is estimated that by the year 2010, commercial air accidents could reach the rate of fifty-three per year.<sup>9</sup> This accident rate is not considered alarming and can be wholly attributed to the increase in air traffic.<sup>10</sup> As a society, we should not be happy with an "unalarmed" air accident rate. Several leading air safety and risk management experts have called for an overhaul in the ways that the commercial air industry manages its risks and investigates crashes.

This Comment evaluates the possibilities of new risk management and crash investigation techniques. In addition to discussing the feasibility of these proposals, it considers whom is best positioned to implement or require these new ideas. Perhaps most importantly, it grapples with the potential legal issues faced by the air carriers, their insurers, and regulators if the proposed techniques are adopted.

## II. WHAT IS RISK MANAGEMENT?

Most people think of "risk management" as purchasing liability and first party insurance coverage. Indeed, most businesses of any considerable size have a "risk manager" or even a "risk

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<sup>8</sup> *Id.*

<sup>9</sup> Robert G. Knowles, *Airline-Crash Prevention Seen as Needed*, NAT'L UNDERWRITER, PROP. & CASUALTY—RISK & BENEFITS MGMT., Nov. 28, 1994, at 21 (estimate given by Paul D. Russell, Boeing's chief airline safety engineer).

<sup>10</sup> *Id.*

management department." Their main responsibility lies in deciding which types of insurance the company should carry and with which carriers. As will be shown, insurance also plays an important role in creating an overall risk management plan to increase safety. But this Comment is not wholly concerned with risk management in this popular sense; a comprehensive risk management plan accomplishes three goals: (1) evaluating loss potential; (2) utilizing risk management techniques; and (3) putting together a risk management plan.

#### A. EVALUATING LOSS POTENTIAL

First, the entity seeking to manage its risk must determine which of its activities create a potential for loss or exposure to liability.<sup>11</sup> Once the entity determines which activities create potential losses, it must calculate the potential amount of loss.<sup>12</sup> The potential amount is not simply the total amount the entity stands to lose. Rather, it is the total potential loss multiplied by the percentage chance that the loss will occur.<sup>13</sup> Loss is not just confined to economic setbacks. For example, besides the physical and monetary losses due to accidents, airlines face the public relations setbacks that stem from disasters.

At present, crashes are relatively infrequent and the public reacts with predictable initial shock. After a while, however, faith in air carriers returns. As the number of flights increases and the number of crashes increases proportionally, the public may become less forgiving. Major fatalities are easy to ignore when they happen once or twice a year. If they begin happen-

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<sup>11</sup> 2 BETTY VAN DER SMISSEN, *LEGAL LIABILITY AND RISK MANAGEMENT FOR PUBLIC AND PRIVATE ENTITIES* § 23.21 (1990). Van der Smissen's treatise is primarily concerned with liability exposure for sports and recreational activities. But her excellent discussion of risk management holds true for any type of risk-bearing activity.

<sup>12</sup> *Id.* § 23.22.

<sup>13</sup> This is a standard insurance doctrine. See ROBERT E. KEETON, *BASIC TEXT ON INSURANCE LAW* 4-5 (1971). By way of illustration I offer the following example. An air freight carrier flies one thousand flights per year. Each flight has the potential hull loss of \$3 million and cargo loss of \$1 million. There is a .01% chance that any given flight will crash. By multiplying these numbers together we get the carrier's potential loss for the year:  $1000 \times (\$3,000,000 + \$1,000,000) \times .0001 = \$400,000$ . In addition to providing a guideline for the amount the carrier should spend for insurance, this number also indicates the amount of risk the carrier undertakes. Actions or procedures that increase the amount of the number, such as hauling cargo worth \$2 million in each flight (resulting in a potential loss amount of \$500,000), indicate that the carrier is acting in a riskier manner. Actions that lower the potential loss indicate the carrier is acting more safely.

ing every two or three months, public faith in air carriers may begin to suffer. When the entity understands the amount of its potential loss it then engages in risk management. By creating operational plans and procedures, the loss can be minimized.<sup>14</sup> Four basic techniques are used to minimize the loss: elimination, reduction, transfer, and retention.<sup>15</sup>

## B. RISK MANAGEMENT TECHNIQUES

### 1. *Elimination*

The first approach to risk management is elimination.<sup>16</sup> An air carrier can eliminate its potential for loss by choosing not to engage in the risk-bearing activity. In most cases, this is the least viable option. An air carrier can no longer function if it refuses to engage in the risky practice of flying aircraft. But limited adoption of this technique is possible. For instance, removing aging aircraft from the fleet eliminates the higher crash risk that those craft impose.

Elimination, also called avoidance, is usually the furthest removed from traditional insurance practice. With some exceptions, insurers are usually willing to insure any activity for which they can quantify risk and attain an adequate pool of insureds.<sup>17</sup> Because of the availability of insurance for most risk-bearing activities, insurers have no incentive to guide their insureds to eliminate all risk-bearing activities. If there is no risk, then there is no need for insurers.<sup>18</sup> The decision to avoid risk is primarily economic. The greatest incentive for avoidance is "to minimize operational and revenue disruptions."<sup>19</sup>

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<sup>14</sup> 2 VAN DER SMISSEN, *supra* note 11, § 23.23.

<sup>15</sup> *Id.*

<sup>16</sup> *Id.* § 23.231.

<sup>17</sup> This is not to say that every type of activity is insurable. For instance, intentional conduct often cannot be insured for economic and social policy reasons. Economically, it is cheaper for the insured to forgo the intentional conduct than obtain insurance. As a matter of social policy, the liability for intentional acts should be borne by the actor and not a third party.

<sup>18</sup> Of course, insurers will want their insureds to incur less liability, but this is not elimination. See discussion of reduction *infra* part II.B.2. For example, a company is considering building a new warehouse, but that will expose it to a risk of fire. Its insurer is not likely to counsel the company to *avoid* the risk by not building the warehouse. Rather, the insurer will try to sell the company insurance coverage for the new warehouse. The insurer will still prefer that the insured install a sprinkler system and *reduce* the risk of fire loss. But it will also prefer that the insured build the warehouse, incurring the need for additional insurance coverage.

<sup>19</sup> GRAY CASTLE ET AL., THE BUSINESS INSURANCE HANDBOOK 8 (1981).

## 2. Reduction

Reduction is very similar to elimination, but often involves something less than totally abstaining from the risky action. The party seeks to reduce the risk accompanying the activity rather than refusing to engage in it.<sup>20</sup> A good example of reduction is Southwest Airlines' short commuter-type flight routes. By creating several shorter flight plans, Southwest has created broad regional coverage without accepting the higher risk of longer flights.<sup>21</sup> Its exemplary safety record reflects this reduction.<sup>22</sup>

In addition to the obvious pre-loss reduction methods of reducing the chance of an accident, there is also the post-loss method of loss control. The two main methods for minimizing a loss that has already occurred are minimization and salvage.<sup>23</sup> This Comment is mainly concerned with flight safety, so post-loss control is not instantly apparent. It is important to remember that the potential losses involved are not just economic, but also social. Given the destructive nature of air accidents, post-loss control of hull damage and casualties is unlikely. But rapid response, interaction with grieving families, and excellent public relations can minimize the loss of passengers due to poor consumer confidence. If the public perceives airlines as large

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<sup>20</sup> *Id.* at 9.

<sup>21</sup> This is not to suggest that risk management was Southwest's primary consideration in creating shorter flight plans. It may not have even been a concern at all. But whether or not there was a conscious risk management decision, Southwest's practice unquestionably fits into a reduction type of risk management technique.

<sup>22</sup> During the 24 years that Southwest has been flying, it has never had a major accident. Patrick Barta, *Retired Airline Executive Jack Vidal Jr. Dies*, DALLAS MORNING NEWS, Dec. 28, 1995, at 26A. Dr. Arnold Barnett, an aviation safety expert, considers Southwest to be the safest domestic carrier. He feels this is of special merit given that Southwest's routes fall primarily within areas with high incidences of tornados. *Today: MIT Researcher, Dr. Arnold Barnett, Rates the Risk of Flying by Individual Carrier* (NBC television broadcast, Sept. 13, 1994), available in WESTLAW, ALLNEWS Database, 1994 WL 3766457. As an example, perhaps, of the type of aggressive risk management and minimization advocated by this Comment, Southwest has not rested on its spotless safety record. In a memo dated March 24, 1995, Southwest urged all of its pilots to remain vigilant. The memo alluded to some failures to observe detail and follow flight procedures. Although no accidents resulted, Southwest felt it was necessary to admonish the pilots to "follow[ ] flight procedures, us[e] common sense, pay[ ] attention to detail and deal[ ] professionally with other pilots." *Southwest Airlines Urges Pilots to Focus on Safety*, Associated Press Newswire, May 11, 1995, available in WESTLAW, ALLNEWS Database, 1995 WL 4387765.

<sup>23</sup> C. ARTHUR WILLIAMS, JR. & RICHARD M. HEINS, *RISK MANAGEMENT AND INSURANCE* 178 (5th ed. 1985).

corporations that can afford to lose an occasional aircraft, then no amount of safety calculations and comparisons will erase the fear caused by a fatal accident.

### 3. *Transfer*

Another common type of risk management is transfer. This technique involves shifting the risk of loss to another party, typically an insurance carrier.<sup>24</sup> This technique is the easiest to implement and serves the valuable purpose of creating a risk pool. The risk-encountering entity can then cooperate with other entities to ensure a greater likelihood that money will be available to cover losses. The problem with this technique is that it carries the chance of "moral hazard." Essentially, the insured entity may decide to exercise less caution because it no longer bears the risk of the loss.<sup>25</sup> Insurers try to mitigate the moral hazard by employing different techniques. But these are not always effective in creating an incentive for the insured to exercise more care or in mitigating the total cost to society from the losses.<sup>26</sup>

### 4. *Retention*

The fourth method of risk management is retention. Retention involves the entity assuming some of the risk itself, either through a "self-insurance" plan or through a "deductible" imposed by the insurer.<sup>27</sup> Self-insurance, for the purposes of this Comment, involves setting aside a periodic premium amount based on the entity's potential loss and using the created pool to pay for actual losses as they occur. A deductible is a gap in initial insurance coverage for which the entity must assume responsibility. Both of these techniques create an incentive for the entity to lower its risk of loss, thus increasing profits.

Interestingly, complete retention of risk is actually economically advantageous for the air carrier. If the carrier can determine with reasonable accuracy what its losses will be for the year, it can set aside enough money every year (or quarter or other measuring period) to cover those losses. Essentially, an

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<sup>24</sup> See *id.* at 198.

<sup>25</sup> See *id.* at 222. The authors actually refer to insurance creating disincentives to exercise care as "morale hazard." They define "moral hazard" as "increas[ing] the chance that some person will intentionally (1) cause a loss or (2) increase its severity." *Id.* This seems to be an unnecessary distinction. Whether the loss is intentional or merely negligent, the end result is the same.

<sup>26</sup> See *infra* discussion accompanying notes 64-69.

<sup>27</sup> WILLIAMS & HEINS, *supra* note 23, at 200, 230.



insurer engages in this same practice, but on a larger scale. Of course, the insurer also builds in a profit for itself. By engaging in complete retention, the air carrier can save this profit amount. Unfortunately, the air carrier still runs the risk of unforeseen losses or unusually high accident rates for the year. While the air carrier should be able to recover the amount of the loss by the savings from years without accidents, the present catastrophic loss could put the carrier out of business before later savings could be realized.

Insurers mitigate this risk by creating large pools of insureds from which to draw premiums. The more insureds that fit into a risk group, the more effectively the insurer can estimate the potential risk losses. A highly organized form of retention is "captive insurance" where the insured actually creates a private insurance company that covers that company's risks only.<sup>28</sup> This is feasible mainly for very large companies that want something resembling traditional insurance, but prefer to generate underwriting profits for themselves rather than an insurer.

### C. PUTTING TOGETHER A RISK MANAGEMENT PLAN

It should be pointed out that these different techniques are not exclusive. Elimination, for example, can be conceptualized as a type of reduction. The entity can reduce its overall risk by eliminating its riskiest endeavors or by eliminating factors and procedures that create higher risks. Transfer and retention do not, in themselves, create efficient risk handling. But they can create incentives for entities to reduce their risks, thus benefiting both themselves and society.

Given that air carriers already engage, at least to some degree, in transfer and retention, the main concern of this Comment will be applying reduction techniques to the industry. Certainly, the industry already engages in some reduction of risk. Federal Aviation Regulations impose reduction requirements as well. But industry experts have recently called for more reduction-type practices in the industry.<sup>29</sup> There are three methods by which reduction of loss-risk can be accomplished.

The first method is reducing the frequency of the hazard. This might also be considered a type of elimination technique. By engaging in risky activities less often, or refusing to engage in

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<sup>28</sup> CASTLE ET AL., *supra* note 19, at 17-18.

<sup>29</sup> See Knowles, *supra* note 9, at 21.

them at all, the airline lowers its overall risk of loss.<sup>30</sup> An excellent example can be found in recent headlines. Faced with the increasing threat of terrorist attacks, the FAA restricted parking within 300 feet of terminals and banned unattended curbside vehicles.<sup>31</sup> Airport authorities identified unrestricted parking as potentially risky because a bomb could be planted in a car next to the airport, causing considerable damage. By restricting parking, airports reduce their risk of loss.

Ironically, the recent security decisions highlight the problems involved with government-imposed risk management. Just less than two months after implementing the new policy, the FAA relaxed the parking restrictions on November 19, 1995.<sup>32</sup> This move was primarily motivated by airport complaints about the inconvenience to Thanksgiving travelers.<sup>33</sup> The restrictions were probably excessive to begin with, especially considering the lack of any specific threats.<sup>34</sup> This type of over-broad action is a common criticism of government intervention. The fact that the policy was restricted due to public pressure and to facilitate holiday travel highlights the inherent weakness in government agency intervention. Populist and political pressure can undermine otherwise sound policy considerations. After the holiday travel season, the FAA readjusted security measures, but in a less drastic fashion.<sup>35</sup> Airports in Dallas, New

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<sup>30</sup> 2 VAN DER SMISSEN, *supra* note 11, § 23.231.

<sup>31</sup> Marlon Manuel, *Airport Parking Rules Irritate Drivers of Vans; Anti-Terrorism Measures: Restrictions Aimed at Thwarting Truck Bombs Bring Irate Reactions*, ATLANTA J. & CONST., Oct. 13, 1995, at A1. The order was made on October 1, 1995, and was "sparked by a number of recent events, including the conviction of Muslims for the bombing of the World Trade Center in New York, the United Nations' 50th anniversary celebration this month, the Arab-Israeli peace process currently underway and Pope John Paul II's visit to the United States." *DOT Tightens Airport Security Again Despite Lack of Definite Threat*, WORLD AIRPORT WK., Oct. 10, 1995. It may also have been related to the paranoia accompanying the Oklahoma City Bombing of April 19, 1995. The policy was not related to any "specific threat to aviation or any other form of transportation." *Id.* (comments of Transportation Secretary Federico Peña).

The policy was unpopular, even before it was implemented. Fearing the implementation as early as August 1995, the Dallas-Fort Worth airport was already protesting the inconvenience of lost parking and revenue and the \$70,000 a day in police overtime. Lisa Miller, *Takeoffs & Landings; Safety Second*, WALL ST. J., Aug. 25, 1995, at B14. One can only speculate about how this reaction reflects on the industry's attitude toward risk management.

<sup>32</sup> *Questions Raised over Eased Airport Security*, AIR SAFETY WK., Dec. 4, 1995, at 1.

<sup>33</sup> *Id.*

<sup>34</sup> See *supra* note 31 and accompanying text.

<sup>35</sup> *FAA Keeping Low Profile on Airport Security*, AIR SAFETY WK., Jan. 29, 1996, at 2.

York, and Atlanta had already implemented the procedures and were less critical of the orders.<sup>36</sup> This either suggests that restrained government action is more easily received or that only de minimis regulation is acceptable to the industry.

The second technique is similar to the first. By either reducing the number of accidents while maintaining a constant number of exposures, or by maintaining the number of accidents while increasing the number of exposures, the airline can reduce its overall potential loss.<sup>37</sup> As an example of the first method, consider the risk of a terrorist bombing on a passenger jet. If an airline reduces the number of incidents from one in one million to one in two million, it has cut its potential loss by fifty percent. This could be accomplished in many ways such as improved baggage screening or better airport security.

The second method is harder to illustrate. Imagine an airline with an aging fleet of 100 aircraft that creates annual revenues of \$10 million. All of these aircraft are ten years old. Suppose further that for ten-year-old aircraft there is a 1% chance of a crash and the loss occurring from the crash will be \$1 million. Given these numbers, the airline has a high probability of incurring a single \$1 million loss equalling 10% of its gross income. The airline adds fifty more new aircraft, generating an additional \$5 million in income with a virtually 0% chance of crashes in the first year.<sup>38</sup> As a result the airline has increased its exposure to risk by 50%, but it has maintained a constant number of accidents. Its potential loss is the same, but it is now only 6.7% of its gross income.

The final technique of reduction is reducing the extent of the loss. By creating contingencies that mitigate the loss amount, the airline saves money and reduces the loss to society.<sup>39</sup> Examples of mitigation techniques include pilot training for safer crash landings and effective passenger evacuation techniques. Post-crash mitigation can also reduce the amount of loss. Rapid public relations response and quick creation of new safety procedures in response to a crash can prevent the loss of valuable public faith. Failure to address public safety concerns in the media may result in the loss of future business. These types of

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<sup>36</sup> See *id.*

<sup>37</sup> See 2 VAN DER SMISSEN, *supra* note 11, § 23.234.

<sup>38</sup> Obviously other factors will affect the chance of crashing, but these have been ignored for the sake of the hypothetical.

<sup>39</sup> Cf. 2 VAN DER SMISSEN, *supra* note 11, § 24.234 (discussing the reduction technique and its benefits).

losses are largely uninsurable and the only feasible way to manage the damage is to avoid them as much as possible.

### III. THE NEED FOR IMPROVED RISK MANAGEMENT

Even if the current accident rates are maintained, the number of commercial airliners will double by 2010.<sup>40</sup> Boeing estimates that failing to adopt preventative risk management techniques could result in "as many as 53 commercial air crashes a year, worldwide."<sup>41</sup> A Boeing study of 232 crashes occurring between 1982 and 1991 found that the largest cause of those accidents was "failure of the flight crew to follow approved basic procedures."<sup>42</sup> The study also "clearly show[s] that regional and cultural differences among air crew members are factors in causing accidents and incidents."<sup>43</sup> This "implies the need for a variety of preventative actions, including better flight crew training and compensating for cultural and regional differences when assembling flight crews."<sup>44</sup>

#### A. CONTROLLED-FLIGHT-INTO-TERRAIN: A RISK MANAGEMENT CASE STUDY

An excellent practical example of the need for heightened safety through better reduction techniques can be seen in controlled-flight-into-terrain (CFIT) accidents. Between 1976 and 1993, seventy-six aircraft accidents were caused by CFIT. Between 1988 and 1994, thirty-two such accidents were reported.<sup>45</sup> These accidents comprise twenty-five percent of the period's total hull losses and twenty-one percent of the hull loss costs.<sup>46</sup> The accidents between 1988 and 1994 account for 41% of the period's passenger fatalities and \$1 billion in insurance losses.<sup>47</sup>

These numbers are even more striking because almost all modern aircraft are equipped with ground proximity warning systems (GPWS). These devices warn cockpit crews of impending CFIT accidents.<sup>48</sup> Despite the widespread use of GPWS,

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<sup>40</sup> Knowles, *supra* note 9, at 21.

<sup>41</sup> *Id.* (comments of Paul D. Russell, Boeing's chief airline safety engineer).

<sup>42</sup> *Id.*

<sup>43</sup> *Id.*

<sup>44</sup> *Id.*

<sup>45</sup> Stacy Shapiro, *Aviation Underwriter Calls for Action: Insurers Must Play Safety Role*, BUS. INS., Apr. 11, 1994, at 12.

<sup>46</sup> *Id.*

<sup>47</sup> *Id.*

<sup>48</sup> *Id.*

CFIT accidents are not decreasing. According to John Brennan, chairman and chief executive officer of U.S. Aviation Underwriters Inc., the problem stems from pilots' lack of understanding about the reliability of the system.<sup>49</sup> Early systems were less reliable and known for giving occasional false alarms. The modern system, however, averages only one false alarm in 5000 flights.<sup>50</sup> A 1989 flight cockpit tape of a Continental Airlines' Flying Tigers 747 cargo plane indicates the cockpit crew repeatedly ignored warnings to pull up. Because of the system's previous reputation for false alarms, crews are often advised by instructors to "ignore the warnings."<sup>51</sup>

#### B. THE INADEQUACY OF GOVERNMENT IMPOSED RISK MANAGEMENT

Regulatory mandates of GPWS do not appear to have alleviated the problem. The United States has required major air carriers to implement the system since 1975.<sup>52</sup> The problem may lie in the National Transportation Safety Board's (NTSB) mandate to only identify the probable cause of the accident.<sup>53</sup> The NTSB's report on such accidents is likely to read "pilot failed to pull up." This is certainly an accurate description of the accident's probable cause, but it fails to suggest any solutions. There is no explanation as to why the pilot ignored the system. There are no recommendations as to how to avoid similar accidents in the future.

#### C. "CHAIN-OF-EVENTS" ANALYSIS

Instead of probable cause, classical risk management analyzes the entire chain of events leading to the accident. Multiple actions that could have averted the crash are identified. These not

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<sup>49</sup> See *id.* (comments of John Brennan).

<sup>50</sup> Shapiro, *supra* note 45, at 13.

<sup>51</sup> *Id.*

<sup>52</sup> 14 C.F.R. § 121.360 (1995). "[A]fter December 1, 1975, no person may operate a turbine-powered airplane unless it is equipped with a ground proximity warning system . . . . [T]he Airplane Flight Manual shall contain—(1) Appropriate procedures for—(i) The use of the equipment; (ii) Proper flight crew action with respect to the equipment." *Id.* § 121.360(a), (b)(1)(i), (ii). Aside from the manual requirements, there is no explicit regulatory mandate of pilot training on the use or reliability of the equipment.

A similar requirement for any turbine-powered airplanes with 10 or more passenger seats took effect on April 20, 1994. *Id.* § 135.153.

<sup>53</sup> See 49 C.F.R. §§ 831.4, 1131 (1995). The NTSB is to investigate all of the relevant facts about the accident to determine if probable cause exists. *Id.*

only pertain to the pilot, but also to other actors who could have alerted the pilot to his error. Paul D. Russell, Boeing's chief airline safety engineer, identifies five actions that could prevent such a crash.<sup>54</sup>

First, the pilot could have detected the mistake and pulled up in time to avoid crashing into the ground. Even without the GPWS, the pilot should have been able to detect the low altitude and compensate accordingly. The next possible way to have avoided the accident would have been for the pilot to maintain the proper altitude, thus avoiding the need to pull up at all. The pilot's failure to maintain a proper altitude could indicate more serious problems such as pilot fatigue or inattention. Another possible way to avoid the crash would have been for the co-pilot to detect the mistake of the pilot. Similarly, the air traffic controller could have discovered the plane's low altitude on a cross-check and told the pilot to pull up. Finally, the cockpit crew could have heeded the GPWS.<sup>55</sup>

Rather than just seeking to assess blame or identify a single cause, risk management identifies several ways to increase safety.<sup>56</sup> The five actions that could have avoided the crash immediately suggest at least four inexpensive, easily instituted ways to decrease the risk of a crash. In order to have the pilot detect and correct the low altitude or maintain proper altitude, air carriers could better train the pilots in those techniques. Instituting more frequent and better co-pilot cross-checks would increase the chance that the co-pilot could detect the error in time. Increased air-controller vigilance would make it more likely that the pilot would get a warning from the ground. Finally, better pilot training on the function and reliability of the GPWS would promote better reaction when the system gives an alarm.

#### IV. WHO SHOULD IMPLEMENT RISK MANAGEMENT?

If it is agreed that the air carrier industry would benefit from greater risk management, it is necessary to decide who should execute such a plan. Four distinct entities could engage in or mandate a chain-of-events risk management analysis. Each pos-

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<sup>54</sup> Knowles, *supra* note 9, at 21.

<sup>55</sup> *Id.*

<sup>56</sup> Probable cause analysis is also likely to underrepresent the wide variety of causes of similar accidents. In the CFIT accident example, *supra* notes 45-47 and accompanying text, the probable cause would be that the pilot failed to pull up. It remains unknown whether the pilot failed to pull up because he was inattentive, misunderstood the warning, or believed that the GPWS was untrustworthy.

sible entity has advantages and disadvantages. The FAA and NTSB could engage in risk management, but air carriers are likely to resist these attempts. The air carriers themselves could utilize these techniques, but it is questionable how much they would be motivated to use this sort of analysis without a regulatory or statutory mandate. The insurance carriers could engage in risk management analysis. The insurance carriers are probably best suited to this task because they already have established techniques in place for assessing risk.

#### A. REGULATORY RISK MANAGEMENT

##### 1. *The Current Role of the NTSB*

The modern regulatory system came into existence when Congress created the United States Department of Transportation (DOT) in 1966. When it created the DOT, Congress also created the NTSB.<sup>57</sup> Under the statute, the NTSB has the authority to make two findings about air accidents. First, the NTSB reports the facts and circumstances of the accident. Then, based on those facts and circumstances, the NTSB is to report its finding of the probable cause of the accident.<sup>58</sup>

The principal purpose of the NTSB is to promote safety. It accomplishes this by using its investigative functions. Based upon these investigations, the NTSB is supposed to develop recommendations about how to prevent future accidents. This is clearly shown in the language of the statute creating the NTSB. The NTSB should "propose corrective action to make the transportation of individuals as safe and free from risk of injury as possible."<sup>59</sup> Once the NTSB has made these recommendations, the DOT can enact them as enforceable regulations.<sup>60</sup> The NTSB has no official regulatory power of its own. It cannot promulgate its own safety mandates. But the NTSB's regulatory recommendations have an acceptance rate of eighty percent by various regulatory agencies.<sup>61</sup>

While the NTSB has proven effective, there is room for improvement. Paul D. Russell, Boeing's chief airline safety engineer, thinks that the NTSB's probable cause determination is

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<sup>57</sup> 49 U.S.C. § 1111 (1994) (originally enacted as Act of Oct. 15, 1966, Pub. L. No. 89-670, § 6, 8 Stat. 938).

<sup>58</sup> *Id.* § 1131; 49 C.F.R. § 845.40 (1995).

<sup>59</sup> 49 U.S.C. § 1116(a)(2).

<sup>60</sup> *Id.* § 1135.

<sup>61</sup> 1983 NTSB ANN. REP. 4.

not enough. "We're calling for a shift from a cause-analysis approach to analyzing aircraft accidents to . . . analyzing the chain of events that led to them."<sup>62</sup> Even though the NTSB has moved toward a risk management approach "[it] still lacks a mandate to identify anything other than the probable cause of an accident."<sup>63</sup>

By engaging in a chain-of-events risk management analysis, the NTSB would gain a better understanding of the accident. For example, just determining probable cause of an accident might indicate that the crash was caused by pilot error. Pilot error can hardly be corrected by regulation; the best the NTSB could hope for would be to attack the problem laterally. Mandating more pilot training and better screening might have some effect, but pilots would still commit errors. But if the NTSB investigated other actions that might have averted the accident such as more co-pilot cross-checks to catch the error, it could create effective new regulations.

A regulation mandating more frequent cross-checks might have a profound effect on the occurrence of pilot error. The same might also hold true for a change in air traffic controller monitoring of aircraft altitude. As self-apparent as these seem, they only become truly apparent when we look at the series of events that failed to prevent the accident rather than just the singular "probable cause" as currently mandated for the NTSB. Probable cause only identifies the imminent reason for the accident. A finding of "the pilot failed to pull up" explains why the plane crashed. But we still do not know why the pilot did not pull up and how this could be avoided in the future.

## 2. *Why Regulate? Insurance and the Downfall of Reasonable Care*

Of course, the air carriers themselves should have reasonable incentives to engage in these practices without regulatory interference. But it is important to consider the effects and limitations of insurance. To a certain extent, the existence of liability insurance itself may discourage effective risk management. As the risk has been transferred to the insurer, the insured (in this case, the air carrier) may feel free not to engage in any other desirable and highly appropriate risk management techniques.<sup>64</sup>

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<sup>62</sup> Knowles, *supra* note 9, at 21.

<sup>63</sup> *Id.*

<sup>64</sup> See Stanley Ingber, *Rethinking Intangible Injuries: A Focus on Remedy*, 73 CALIF. L. REV. 772, 790-93 (1985); Stephen D. Sugarman, *Doing Away with Tort Law*, 73



Insurance carriers attempt to counteract this somewhat by using deductibles.<sup>65</sup>

Besides deductibles, the insurer can also create an incentive for the air carrier to be more careful through the use of risk-responsive premiums.<sup>66</sup> Risk-responsive premiums involve the insurer assessing the actual risk involved in the air carrier's activities. Premiums are then adjusted so they reflect the actual cost of the potential loss involved in the risk-bearing activities. The goal of acquiring a lower premium creates an incentive for the air carrier to act more safely to acquire a lower premium.<sup>67</sup> If this is possible, the moral hazard posed by liability insurance may be minimized.<sup>68</sup> Punitive damages may also provide a deterrent if the injured plaintiffs can prove that the air carrier engaged in risky behavior believing that its insurance would shield it from liability and allow it to continue to realize a profit.<sup>69</sup>

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CAL. L. REV. 555, 603 (1985); Alan O. Sykes, *Reformulating Tort Reform*, 56 U. CHI. L. REV. 1153, 1155 (1989) (reviewing PETER W. HUBER, *LIABILITY: THE LEGAL REVOLUTION AND ITS CONSEQUENCES* (1988)); cf. also P.S. Atiyah, *No Fault Compensation: A Question That Will Not Go Away*, 54 TUL. L. REV. 271, 288 (1980); Peter Cane, *Justice and Justifications for Tort Liability*, 2 OXFORD J. LEG. STUD. 30, 44-46 (1982).

<sup>65</sup> This is a method of forcing the insured air carrier to accept some retention of the risk. See discussion of risk management techniques *supra* part II.B. I submit, however, that this method is not wholly effective. For example, suppose an insured has single accident coverage up to \$200 million with a \$100,000 deductible. If one accident a year (resulting in \$200 million in damages) could be avoided by spending \$200,000 in prevention programs, that would be economically beneficial. But the insured has a disincentive to pay the \$200,000 avoidance cost because it will only be losing a \$100,000 deductible instead of the \$200,000 in training costs. This is not to say that insurers cannot avoid this moral hazard in other ways. See *infra* notes 66-68 and accompanying text.

<sup>66</sup> For a discussion of risk-responsive premiums, see Gary T. Schwartz, *The Ethics and the Economics of Tort Liability Insurance*, 75 CORNELL L. REV. 313 (1990).

<sup>67</sup> To help understand this it is useful to reconsider the hypothetical in *supra* note 65. The insured has no incentive to engage in safer behavior if that behavior will cost more than the \$100,000 deductible, say \$200,000. The insurer can make engaging in the safer behavior an underwriting criteria. Then, by raising the base insurance rate \$100,000 (the difference in cost between the deductible and the risk avoidance technique) the insurer can offer a discount of \$100,000 in the premiums if the air carrier will engage in the safer practice. Given that the economic incentives are equal on either side, it is expected that the air carrier will choose to avoid the accident.

<sup>68</sup> See Schwartz, *supra* note 66, at 336-37.

<sup>69</sup> Given the present societal, political, and judicial disfavor for punitive damages, I am disinclined to put too much faith in the ability of punitives to make our society safer. Additionally, there has been much discussion about the possibility of allowing insurance for punitive damages. Such a development would likely turn the tort liability incentive on its head. Decisions about the amount of

### 3. *Just Compensation Is Not Enough*

Aside from the hazards posed by liability insurance, it is important to consider what liability insurance does not accomplish. Insurance adequately compensates known victims who can prove that they were directly injured, but compensation should be a last ditch effort. If accidents can be avoided in a cost-effective manner, society will realize a much greater benefit.

Liability insurance does not fully compensate for losses caused by risky behavior. Not all the victims of accidents are compensated. Decedents without families pass on no standing for recovery. Their deaths and losses go without compensation. That is not to say that there is no loss for these victim's deaths. They may be productive employees or entrepreneurs, but the economic effects of their deaths are not compensable.

For that matter, losses resulting from the deaths or injuries of victims with families are not compensable unless claimed by the families. For example, if a small business owner died in an air accident, resulting in the forced closing of her business, society as a whole would not be completely compensated. The victim's husband and children could recover the amount of lost earnings that they would have received, but the victim's employees would be left jobless with no compensation for their loss.

Even the compensation families do receive often proves inadequate. The Warsaw Convention contains damage caps that create a de facto inadequacy in many cases.<sup>70</sup> If the loss suffered by an individual victim or her estate and family exceeds the damage cap, then there will be inadequate compensation. The ever present lack of adequate coverage also serves to undercompensate. A small air carrier with \$1 million in coverage and \$2 million in damages is likely to disappear, leaving at least \$1 million of undercompensated losses.

Even more important than the undercompensation of victims, however, is the realization that liability insurance coverage does not lower the loss to society. The value of insurance is that it creates large reserves of capital that are available to protect the *insured* against a high loss. If the insurer wishes to remain solu-

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risk prevention to engage in would be likely to have much more basis in profit margins than acceptable levels of safety.

<sup>70</sup> International Convention for the Unification of Certain Rules Relating to International Carriage by Air, Oct. 12, 1929, art. 22, 49 Stat. 3000, 3006, 137 L.N.T.S. 11, 24 [hereinafter Warsaw Convention] (codified at 49 U.S.C. § 40105 (1994)).

ble, it must charge premiums that will create a reserve large enough to cover all the potential losses. The cost of these premiums is spread among all members of society. This creates a lowering of capital available for investment.

An example best demonstrates this idea. Suppose a carrier pays \$210,000 per year to insure against a \$1 million hull loss. This premium is based on a twenty percent chance that the carrier will suffer such a loss each year.<sup>71</sup> After ten years, the carrier does indeed suffer such a loss. It uses the insurance proceeds to purchase a new aircraft. The insured is left in the same position it was before the accident, but the insured has lost over \$2 million in insurance premiums. Essentially it has received one airplane for the price of two. Economically, it is more efficient for the carrier to avoid the accident than to insure itself. Insurance should ideally act as a safety net for our society when extreme situations so dictate. It is not effective as a means of reducing risk or enhancing safety.

Because insurance may counteract the tort incentive, even if only to a slight degree, government regulation has a place in the risk management process. If the economic incentives of the tort system fail to elicit reasonably safe actions, government regulation can augment the usual tort incentives. When an air carrier operates in an unreasonably risky manner, the FAA or DOT can impose fines or revoke the carrier's license. Such penalties are typically uninsurable and the carrier will have to choose between further penalties or a personal loss.

As part of the existing regulatory scheme, air carriers are already required to obtain minimum amounts of liability insurance.<sup>72</sup> These minimums are useful in assuring that adequate reserves are available to compensate for liability. But they do not address the possibility of moral hazard resulting from this insurance coverage. Carriers can self-insure and meet the requirements of the regulations;<sup>73</sup> this would help mitigate the moral hazard problem.<sup>74</sup> But the regulations do not require either self-insurance or a deductible that would give the carriers added incentives to act safely.

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<sup>71</sup> The extra \$10,000 per year covers the insurer's overhead and profit.

<sup>72</sup> 14 C.F.R. § 205.5(b), (c), (e) (1996).

<sup>73</sup> See 14 C.F.R. §§ 205.3-4 (requiring that carriers provide proof of insurance or an adequate self-insurance plan and the filing of insurance or self-insurance plans).

<sup>74</sup> See *supra* text accompanying notes 24-26.

#### 4. *The Drawbacks to Regulation*

This is not to say that government regulation is a panacea. Contemporary conventional wisdom disfavors most, if not all, government interference in free commerce.<sup>75</sup> This is not entirely unfounded. Government solutions to problems are often unwieldy and expensive, resulting in disarray and wasted resources. Besides these more ideological arguments, however, two practical objections can be raised to "chain-of-events" reports issued by the NTSB: evidentiary and commercial.

As evidence, an NTSB report giving more than probable cause creates a severe prejudice to an air carrier defendant. Presently, NTSB accident reports are admissible with the exception of the actual probable cause determination.<sup>76</sup> As early as 1951, federal courts allowed testimony of Civil Aeronautics Board (CAB) agents to be used in court.<sup>77</sup> The District of Columbia Court of Appeals allowed into evidence a CAB agent's testimony in *Universal Airline v. Eastern Airlines*.<sup>78</sup> The court allowed the testimony because it was the most immediate post-accident observation available.<sup>79</sup> Similarly, in *American Airlines v. United States*<sup>80</sup> the Fifth Circuit Court of Appeals allowed into evidence flight recorder data compiled in a CAB report.<sup>81</sup> The court also explained that opinion testimony should generally be allowed, unless the opinion "embraces the probable cause of the accident or the negligence of the defendant."<sup>82</sup> This view was affirmed in *Kline v. Martin*<sup>83</sup> when the United States District Court for the Eastern District of Virginia allowed normal accident report opinion as evidence because "it is only the ultimate issue, the probable cause of the accident, that is prohibited."<sup>84</sup>

Because any NTSB opinions as to possible actions that would have averted the accident are not probable cause or a determi-

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<sup>75</sup> See Patrick Crowley, *Republicans Seek Smaller Government*, CIN. ENQUIRER, Feb. 14, 1996, at B02; Clinton: *FDR Today Would Urge Smaller Government*, SACRAMENTO BEE, Apr. 13, 1995, at A19.

<sup>76</sup> *Kline v. Martin*, 345 F. Supp. 31 (E.D. Va. 1972). See discussion *infra* accompanying notes 82-84.

<sup>77</sup> The CAB was the precursor of the FAA and generated accident reports determining the probable cause of the accident much like the NTSB does today.

<sup>78</sup> 188 F.2d 993, 999-1000 (D.C. Cir. 1951).

<sup>79</sup> *Id.*

<sup>80</sup> 418 F.2d 180 (5th Cir. 1969).

<sup>81</sup> *Id.* at 196.

<sup>82</sup> *Id.*

<sup>83</sup> 345 F. Supp. 31 (E.D. Va. 1972).

<sup>84</sup> *Id.* at 32.

nation of the carrier's negligence, they would appear to be admissible under the present case law. Air carriers will naturally be averse to seeing such reports in court. In these instances, the carrier would not have to defend against a *single* claim of negligent behavior. Instead, the carrier would face multiple instances of possible negligence. These different instances would be delivered ready-made to potential plaintiffs. To return to the example of CFIT accidents,<sup>85</sup> at least four occasions in the "chain of events" might constitute the carrier's negligence. This is not to say that plaintiffs could win on all or any of these issues, but the carrier will incur the added expense of litigating the claims. It will also have to rebut the very credible report of a government agent that is likely to hold great weight with the jury.

Besides the evidence issue, air carriers may simply want to keep chain-of-events analysis from being used against them in the public's perception. Recently, airline representatives have complained about the presence of the FAA's new safety performance analysis system (SPAS) at four airports.<sup>86</sup> SPAS tracks the performance and safety records of air carriers to determine if air safety trends are developing.<sup>87</sup> The airlines are concerned that the analysis done by the system "could be subject to release under Freedom of Information Act requests and might be a basis for attempts of comparative rankings of airline operators."<sup>88</sup>

Consumers who discover a long list of events that could have averted an accident may conclude that the list indicates a high level of negligence. On the contrary, such reports are more likely to reflect only the complexity of flight and the extreme care taken in preparing the report. But this will offer little solace to a carrier that loses customers when such a report becomes public.

## B. SELF-CONDUCTED RISK MANAGEMENT

### 1. *Existing Risk Management in the Industry*

In many ways, the airline industry already engages in some risk management techniques. The Court of Appeals for the Sec-

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<sup>85</sup> See *supra* part III.A.

<sup>86</sup> *FAA Fields Computerized Safety Check System: Airlines Fear FOIAs*, AVIATION DAILY, Sept. 29, 1995, at 521.

<sup>87</sup> *Id.*

<sup>88</sup> *Id.* (comments of Roger Fleming, senior vice president of technical development for the Air Transport Association).

ond Circuit described the Warsaw Convention itself as "spread[ing] the accident cost of air transportation among all passengers."<sup>89</sup> The court further stated that this purpose of the Warsaw Convention is supported in the supposition that "the protection of the passenger ranks high among the goals which the Warsaw signatories now look to the Convention to serve."<sup>90</sup>

Was the court correct that the Warsaw Convention advances the goals of passenger safety? The specific facet of the Warsaw Convention that the court referred to was the (then) absolute liability amount of \$75,000 for accidents occurring while boarding, leaving, or on board the aircraft.<sup>91</sup> This provision is actually a combination of two of the classic risk management techniques: retention and reduction.

Absolute liability forces the carrier to retain the risk. With negligence liability, an air carrier might be inclined to "play against the risk." If the carrier believes that it can engage in cheaper, riskier behavior and beat the odds, then it might be willing to do it. Logic and the law of large numbers dictate that the carrier will always lose in this transaction. When the carrier engages habitually in negligent actions, a predictable amount of injuries will occur. The carrier will be liable for these injuries, which will often cost more than the amount to engage in less risky behavior. But if we factor in the chance that a negligent carrier might win on a lawsuit when it actually has been negligent, the situation becomes more complicated.

For example, if the cost of non-negligent operation is \$100,000 more than the cost of negligent operation, and if the total amount of damages resulting from negligent operation will be \$150,000, then the carrier should have an incentive to operate non-negligently. The problem is, the carrier may feel, probably justifiably, that it can beat at least \$50,000 of the liability in court. Suddenly, the incentives on either side are equal. Strict liability defeats this perverse incentive. As long as the cost to

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<sup>89</sup> *Day v. TWA*, 528 F.2d 31, 36 (2d Cir. 1975), *cert. denied*, 429 U.S. 890 (1976). In *Day*, passengers waiting to board a plane in Athens were killed by grenade-throwing terrorists. The defendant, TWA, argued that the Warsaw Convention should only be applied to air accidents and not mishaps while waiting to board. The court rejected TWA's argument, largely by viewing the Warsaw Convention as a risk management device, the purposes of which were furthered by allowing suits of this nature.

<sup>90</sup> *Id.* at 37.

<sup>91</sup> *Id.* at 33 (citing Warsaw Convention, art. 17, *supra* note 70).

avoid the injury is less than the possible resulting damages, the carrier is wise to work to avoid the injury.<sup>92</sup>

It is not hard to see, however, that this sort of retention alone could easily lead to the end of the commercial flight industry. Given no opportunity to prove lack of culpability, one large accident could create massive amounts of liability, threatening to destroy the air carrier. The amount of available insurance is finite and based on risks foreseeable by the insurer. If standard tort damages were always allowed, then unforeseeable contingencies could exceed the level of liability insurance and force the airline to declare bankruptcy or go out of business.

For example, many states allow survival recovery equal to the lost wages the decedent was likely to earn over her expected lifetime.<sup>93</sup> This creates the possibility of an unforeseeable amount of liability stemming from an air accident. If twenty highly compensated CEOs are flying to an international convention and their plane crashes in the Andes, the potential unrestricted tort judgments could be enormous. Suppose each CEO earns an average of \$70,000 per year.<sup>94</sup> If the average life expectancy of the CEOs was 30 years, then the total amount of potential liability *just for the CEOs* would be \$450 million. This would not even include recovery for the deaths of the other passengers or the possibility of other noneconomic damages like pain and suffering and mental anguish<sup>95</sup> or the wrongful death damages that might be allowed for a spouse or surviving children.<sup>96</sup> It is easy

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<sup>92</sup> Insurance may still work to thwart this incentive. See *supra* text accompanying notes 64-70.

<sup>93</sup> See, e.g., FLA. STAT. ANN. § 768.21(6)(a) (West 1996) (allowing the decedent's estate to recover loss of earning that would have accrued during the decedent's normal lifetime minus living expenses); IND. CODE ANN. § 34-1-1-2 (Burns 1996) (allowing the recovery of the decedent's wages lost as a result of the wrongful death).

<sup>94</sup> In order to simplify the hypothetical, average amounts will be used instead of actual income and life expectancy. Actual numbers might yield slightly different results.

<sup>95</sup> Texas, for instance, allows recovery for both of these types of damages. The seminal case in the area is, ironically, a suit resulting from an air accident; *Yowell v. Piper Aircraft Corp.*, 703 S.W.2d 630 (Tex. 1986). The relatives of the decedents from the crash of a Piper PA-31-310 recovered the loss of the decedents' future earnings. *Id.* at 632. (In Texas, the future earnings are typified as the plaintiff's loss of inheritance or economic support.) In addition, the decedents' estates recovered \$500,000 each for mental anguish that the decedents suffered resulting from the mid-air breakup of the plane. *Id.* at 634.

<sup>96</sup> Texas also allows generous recovery in the wrongful death area. *Sanchez v. Schindler*, 651 S.W.2d 249 (Tex. 1983). In that case, a 14-year-old was killed in a traffic accident. No lost wages were awarded because the decedent was a minor

to see how one accident might bankrupt an air carrier if strict liability were imposed without any type of damage restrictions.

By imposing a cap on occurrences, the industry has also engaged in classic reduction. Air carriers can engage in the same number of risky events (namely, making flights) without having to encounter extreme levels of liability. The risk of accidents occurring is not reduced, but the liability stemming from the accident is minimized. This does not create a safety incentive, but it balances the harshness of strict liability, which does encourage safety.

## 2. Existing Models for Improved Risk Management

The American aviation industry should look to other players in the world market for examples of how risk management could be employed. Many European airlines have begun aggressive risk management and assessment programs. Singapore Airlines, with one of the world's most enviable safety records, has likewise enacted a highly progressive risk management system.<sup>97</sup>

Often programs involve coalitions of air carriers who pool their information in order to better utilize their resources and create even more economic benefit from the risk management plans. In the past few years, major European airlines have formed a strong coalition to collect and analyze safety data about their aircraft using a program known as the British Airways safety information system (BASIS). BASIS was developed for British Airways by an in-house team and was originally intended only for the British Airways fleet.<sup>98</sup> In 1993, 43 airlines and 105 industry members that belong to the European Regional Airlines Association (ERA) joined BASIS.<sup>99</sup>

BASIS maintains data on each type of aircraft operated by the member air carriers. The system's large database is intended to allow an analysis of trends under headings like "Instruments,

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child. The Texas Supreme Court upheld an award of damages to the parents for mental anguish and loss of companionship. *Id.* at 251. Similar damages were awarded to decedents' survivors in *Yowell*. *Yowell*, 703 S.W.2d at 635-36. Typically, awards for nontangible losses of this type are unpredictable and can be quite large.

<sup>97</sup> See *infra* text accompanying notes 107-11.

<sup>98</sup> Arthur Reed, *ERA Under BASIS Blanket*, (*European Regional Airlines Association Uses Computerized Risk Management Program*), AIR TRANSPORT WORLD, Sept. 1, 1993, at 28.

<sup>99</sup> *ERA Joins BASIS to Enhance Members' Safety Management*, COMMUTER REGIONAL AIRLINE NEWS INT'L, May 24, 1993.



Human Factors, and False Warning.”<sup>100</sup> By using this information, airlines will be able to “evaluate flight and ground procedures, to identify shortcomings in equipment and potential airfield hazards.”<sup>101</sup> The program’s potential is very large because it incorporates the information of multiple air carriers. Rather than just rely on its own data, a member carrier can learn from the mistakes and successes of other carriers.

ERA plans to create a periodic digest based on the products of the system. The digest will identify common types of incidents by aircraft type. These incidents could include “trend analyses, event summaries and articles on specific aircraft fleet trends and airport trend analysis, identification of rogue equipment, summaries of individual events and verbatim reproduction of air safety reports.”<sup>102</sup> Such information could be invaluable to a comprehensive risk management system. Each of these items could give rise to a chain-of-events analysis. Identifying the risks presented by each piece of information could create contingencies and risk reducing methods to cover the entire spectrum of encountered risk.

The system is also effective because it does not just deal with large, catastrophic accidents. The program encourages the reporting of any incident “from malfunctioning ‘undercarriage down’ lights to collisions with service vehicles on the ramp; from bird strikes to minor injuries suffered by cabin staff because of galley equipment.”<sup>103</sup> The system encourages the free exchange of this information by stripping all the reports of carrier identification.<sup>104</sup> The program even allows carriers to file written incident reports; the hope is that these reports will eventually be filed directly into the BASIS computer via modem, eliminating the need for extra paperwork.<sup>105</sup>

The best feature of the system is that it allows the carriers to pool their resources in a single risk management effort, which creates economic efficiency. Instigating and maintaining an independent trend and data analysis program could be very cost

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<sup>100</sup> *Id.*

<sup>101</sup> *Id.*

<sup>102</sup> *Id.*

<sup>103</sup> Reed, *supra* note 98, at 28.

<sup>104</sup> This may be one workable solution to American air carrier’s objections to SPAS. If the purpose of SPAS is indeed to identify potential safety trends and suggest solutions, then identification of the carrier involved should be irrelevant. Valuable suggestions about ways to avoid accidents should be shared with the entire industry and not just with the carrier in question.

<sup>105</sup> Reed, *supra* note 98, at 28.

prohibitive, especially to a smaller carrier. In addition, the large sample created by the conglomeration of large aircraft fleets makes assessments of the risk management system faster. An air carrier maintaining a fleet of one hundred aircraft might need ten years to determine if its new pilot education program will really lower the number of CFITs. By the time the carrier could make that determination, it may have spent a disproportionate amount of money on a system that is ineffective. This could be a disincentive for carriers to engage in aggressive risk management. But if that same fleet of one hundred aircraft pools its information with nineteen other air carriers implementing the same safety system, an effective evaluation of the risk management system might be possible in as little as six months.<sup>106</sup>

Singapore Airlines boasts one of the world's best safety records. In forty years it has only experienced one major incident—a hijacking in 1991.<sup>107</sup> The airline considers risk management to be “a very instinctive part” of its operations.<sup>108</sup> By taking high deductibles on its insurance policies, the airline promotes department accountability for the losses that occur both in hull damage and liability.<sup>109</sup> The program also includes daily risk reviews.<sup>110</sup>

Another interesting aspect of the airline's approach to risk management is that the goals include more than just avoiding crashes. The company has formulated an entire crisis response procedure. For example, the company has methods dictating the manner in which casualties are to be transported, and the type of press exposure that should be allowed. The company also plans to link all regional managers on a crisis alert until discovery of the incident's location. This assures swift reaction to the crisis, possibly saving lives and avoiding unflattering media coverage.<sup>111</sup>

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<sup>106</sup> Six months is a rough estimate based on the assumption that all twenty carriers engaging in the information sharing are similarly situated in terms of types of equipment, number of aircraft, and frequency and duration of flights. Twenty times the information would be available to evaluate a safety program and the evaluation could be completed in 1/20 of the time necessary for a single carrier to make the same conclusions. One twentieth of ten years (120 months) is six months.

<sup>107</sup> Stacy Shapiro, *Airline Is Ready When Crisis Occurs; Singapore Carrier Drafts Detailed Plan*, BUS. INS., Oct. 19, 1992, at 12.

<sup>108</sup> *Id.* (comments of Angela Chua, insurance manager).

<sup>109</sup> *Id.*

<sup>110</sup> *Id.*

<sup>111</sup> *Id.*

### 3. *Special Advantages to Good Risk Management*

Singapore Airlines demonstrates that risk-creating activities are not always limited to activities *traditionally* considered risk-creating. After an aircraft accident, the air carrier is still exposed to added losses through damage to corporate image and public goodwill stemming from the air carrier's poor reaction and its inability to control the situation.<sup>112</sup>

Maintaining an image of safety through risk control can foreclose potential business losses when there is a rise in public concern. For example, following the September 8, 1994, crash of a USAir 737 near Pittsburgh, travel agents began to have problems with passenger's refusing to fly on 737s.<sup>113</sup> One Massachusetts agent said, "[T]hey don't want to fly on a 737 with any carrier."<sup>114</sup> But Southwest Airlines, with its fleet composed exclusively of 193 737s, experienced no problems.<sup>115</sup>

I can tell you that we're not getting calls from people saying I don't want to get on your planes because they're 737s and they're not safe. . . . Also, any time the FAA or Boeing make[s] any recommendations on safety issues regarding airplanes, we generally are working on it before the mandate is even issued.<sup>116</sup>

The lack of consumer concern can probably be attributed in no small part to Southwest's outstanding safety record and risk management techniques.<sup>117</sup>

### 4. *Disadvantages to Self-Imposed Risk Management*

It should be noted that self-imposed risk management by air carriers is not without its drawbacks. If air carriers are unable to

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<sup>112</sup> Losses to image and goodwill may not be insurable. Even if one could obtain a policy protecting these things, collecting on a claim would be problematic. The amount of damage would be difficult to prove, and monetary compensation for such intangible losses would be inadequate. An air carrier would be much better served by avoiding such losses than by seeking to insure against them. This effectively forecloses the possibility that an air carrier could manage these risks through transfer. The carrier is forced to retain the risks and try to reduce the damage. For more discussion about how these two techniques work together, see the discussion of strict liability *supra* in text accompanying notes 92-96.

<sup>113</sup> *Few Travelers Shy Away from USAir, 737s; Tarrant County Agents Say People Seem More Concerned About the Safety of the Airline than the Plane*, FORT WORTH STAR-TELEGRAM, Sept. 14, 1994, at 4.

<sup>114</sup> *Id.*

<sup>115</sup> *Id.*

<sup>116</sup> *Id.*

<sup>117</sup> For a discussion of Southwest's record and risk management, see *supra* notes 21-22 and accompanying text.

form coalitions like the European BASIS program, they could be forced to make expensive mistakes. The greater the database of incidents and potential problems, the more accurate the risk management program. For example, if an air carrier's aircraft has an accident related to navigation systems, that carrier might decide to create a risk management plan to deal with the problem. After expending money to create training programs and new procedures, the carrier might discover that the incident was a freak occurrence. Without a sufficiently broad sample, data can easily become difficult or impossible to interpret correctly.

The evidence problems in a regulatory scheme also apply in this scenario.<sup>118</sup> As reports generated by the carrier pursuant to an accident investigation, risk management chain-of-events analyses might be subject to discovery and admissible into court as evidence. In addition, opinions about causes of the accidents may be admissible as a statement of a party opponent in litigation.<sup>119</sup> The carrier can find no evidentiary refuge in creating its own reports.

### C. INSURERS AS RISK MANAGERS

#### 1. *Existing Risk Management*

Of the three entities involved in safety for the air carrier industry, the insurance carrier is best qualified to execute an aggressive risk management system. In fact, most insurers already engage in all three aspects of risk management planning, but for their own benefit, rather than the benefit of their insureds. The insurer practices elimination through the underwriting process. After evaluating the risks presented by covering an insured, the insurance company decides whether to write a policy. The insurer then retains the risk that it accepts. It collects the premium amounts and creates a reserve that it believes will be sufficient to cover any contingency in the case of a loss.<sup>120</sup> Once the insurance company has accepted and prepared for the risk, it attempts to reduce its exposure.

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<sup>118</sup> See *supra* text accompanying notes 76-88.

<sup>119</sup> FED. R. EVID. 801(d)(2).

<sup>120</sup> Note how elimination and retention affect each other in this arrangement. If the insurer discovers that it cannot charge premiums high enough to cover the insured's potential losses, it must choose to eliminate the risk by refusing to write coverage. Likewise, by eliminating bad risks, the insurer is able to create a reserve with lower premiums, thereby attracting more potential insureds and increasing the profit margin.

2. *Experience and Positioning: Advantages to Insurer-Based Risk Management*

Insurance companies are in the best position to formulate and impose risk management programs. Insurers amass large databases of information, and unlike the FAA or NTSB, their accident and incident reports often include more than just probable cause. In order to create the most accurate representation of the probability that an insured will suffer a loss, insurance companies want to determine which acts or omissions of the insured are related to accident occurrences. Unfortunately, insurers typically do not share this information with the insured. Each insurance carrier has its own proprietary system of determining loss probabilities and is usually unwilling to divulge that information to the insured.

As a potential detraction from the safety incentives of tort and strict liability, insurers arguably should be held more responsible for ensuring adequate safety and risk management measures.<sup>121</sup> The simplest way to minimize the moral hazard aspect is for insurers to utilize a premium system that is risk responsive. That is, the premiums accurately reflect the potential risk of the insured's activities.<sup>122</sup> Insurers could also increase safety by sharing more information about their findings as to how accidents could be avoided.

Insurer-created chain-of-events analysis would be effective for two reasons. First, analysis of a few accidents would yield suggestions for safety measures that could be instituted by all of the insurance company's clients. In turn, if a number of those insureds simultaneously instituted the suggested measures, then a faster determination as to the effectiveness of the techniques could be made. In addition, the chain of events leading to a specific accident could affect safety beyond the immediate scope of that specific accident. For instance, in CFIT instances<sup>123</sup> it might be determined that more frequent co-pilot cross-checks is the most effective way to avoid CFITs in the future. Besides lowering the number of CFITs, cross-checks could also serve to

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<sup>121</sup> See *supra* notes 64-69 and accompanying text, for a discussion of the effect of insurance on tort incentives.

<sup>122</sup> See Schwartz, *supra* note 66, at 336-40 (Schwartz argues that risk responsive premiums all but eliminate the moral hazards posed by liability insurance). I am unwilling to concede that moral hazards disappear when premiums are sufficiently tied to risk, but I do think it goes a long way to remove the disincentives.

<sup>123</sup> See *supra* text accompanying notes 54-56, for a discussion of the chain-of-events analysis and how it suggests ways to avoid CFIT accidents.

lower the instances of other accidents. The insurer, analyzing multiple accident chains of events, could find the most efficient way to avoid several different types of hazards by making one procedural change. Co-pilot cross-checks might be the second best way to avoid five different types of accidents, but the only one common to all five kinds of accidents. If insurers mandated more frequent cross-checks, it would lower the occurrence of five accident types in an efficient manner. An air carrier doing its own analysis would have to rely on its own (hopefully) rare accidents and is unable to see the overall efficiency of using co-pilot cross-checks (number two on the list of ways to avoid the accident) over the top-ranked method of avoiding the accident.

The ability of insurers to create changes in safety practices of its insureds should not be underestimated. The introduction of seat belts into passenger aircraft was prompted by insurance carriers.<sup>124</sup> John Brennan, chairman and chief executive officer of U.S. Aviation Underwriters, believes that "[i]nsurers have to take a more proactive stance in [the] area of aircraft safety. . . . We certainly cannot wait for action to be taken by various regulatory agencies."<sup>125</sup>

Specifically in regards to CFITs, Brennan offers ways in which insurance carriers should take a more proactive stance in safety and risk management. First, he believes that insurers should encourage the use of the latest safety technology.<sup>126</sup> This is probably not as necessary for CFIT accidents because of the GPWS's already strong presence in American aircraft. But as we have seen, presence of the technology is not enough to assure safety.<sup>127</sup> In order to allow the technology to work, Brennan also wants insurance carriers to encourage effective training programs.<sup>128</sup>

Encouraging the greater use of technology and training are methods of reduction that the insurers can use to lower their (and their insureds') losses. Brennan encourages insurers to remind air carriers that compliance with regulations is not necessarily proof of safety.<sup>129</sup> Installation of GPWS has been mandated by regulations for over a decade, but CFIT accidents

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<sup>124</sup> Shapiro, *supra* note 45, at 12.

<sup>125</sup> *Id.*

<sup>126</sup> *Id.*

<sup>127</sup> See *supra* text accompanying notes 48-51.

<sup>128</sup> Shapiro, *supra* note 45, at 12.

<sup>129</sup> *Id.*

have not dropped in that time; they have increased.<sup>130</sup> Reminding carriers of their responsibilities and putting a corresponding onus on the carriers to abide by those responsibilities is another way to reduce the risk of loss. Finally, Brennan believes that insurers should create rating standards that accurately reflect an air carrier's safety based on its participation in the insurance companies' suggested safety techniques.<sup>131</sup> This suggestion is perhaps the most important of all. Increased premiums for noncompliance or incomplete compliance give the air carriers an incentive to engage in the requested actions. This technique is a form of forced retention. The insurance company accepts the risks created by unsafe practices and places them back on the insured air carrier.

### 3. *Using Insurers to Keep Risk Management Information Private*

Another aspect of insurer-based risk management is that it protects the insured air carrier from the risks of civil liability and public opinion damage created by regulatory or self-executed risk management.<sup>132</sup> As a nonparty in a tort liability suit, the insurance company probably cannot be forced to reveal its records.<sup>133</sup> If the insurance company retains all of the information and only provides its insureds with suggestions as to how to improve their safety, a jury will never be able to hear the chain-of-events analysis or possible actions that the air carrier could have taken in an attempt to avoid a crash.

## V. CONCLUSION

Acting in society incurs risks. We acknowledge this when we purchase insurance or even when we decide to stay home rather than brave icy roads on our way to work. Air carriers are no exception. Their everyday business activity of flying passengers and cargo from one location to another creates a measurable risk of accidents that will deprive citizens of property or life. It is impossible to avoid those risks, but intelligent management can bring them to a level we are willing to accept.

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<sup>130</sup> See *supra* text accompanying notes 48-51.

<sup>131</sup> Shapiro, *supra* note 45, at 12.

<sup>132</sup> See *supra* text accompanying notes 101-10, for a discussion of the adverse evidentiary and goodwill effects created by these types of risk management.

<sup>133</sup> Indeed, the insurance coverage contract often disavows any right to the insurer being sued along with its insured.

The industry's safety record is good, but not above reproach. Aging fleets, overworked pilots, and increasingly prevalent social differences create new risks and challenges to the industry's safety record. When we consider the technological advances of the present age, it is apparent that safety records should be *improving*, not merely maintaining their "acceptable levels."

Risk management operates on the principles of efficiency. Just as the tort system is based on making economic decisions, risk management follows dutifully on that path. Negligence might be defined as "refusing to pay one dollar to avoid causing two dollars worth of injury." Risk management might be defined as "refusing to spend \$1000 to control the probable loss of \$2000." If accidents can be avoided through reasonable risk management, then that risk management should be executed.

The best way to determine how to avoid future accidents is to carefully examine past accidents. The tension is created in determining who should engage in those examinations. Currently, the government does most of the investigations through the NTSB. This is useful in determining the probable cause of the incident, but it rarely offers useful solutions. The industry knows itself better than an outside organization ever could. But critical public self-evaluation, as in any potential tort situation, can be disastrous if brought into court. Insurers have the experience to create good risk management programs. They also may be able to discover the crucial chain of errors leading to an accident without the danger of potential plaintiffs having access to the information.

The problem with bare insurer risk management is that the profit motive interferes with the implementation. Extensive risk management programs cost money. If only a portion of the insurance industry engaged in aggressive risk management of its insureds, those insurers would have to charge higher premiums. Given the choice of insurers, air carriers would probably tend to prefer the cheaper insurance companies that decided to forgo insured risk management.

The solution may lie in hybridization and cooperation. As government downsizing becomes more popular, enacting sweeping regulations on airline risk management could be political suicide. But there may be a way to create more risk management and *decrease* government intervention. The present insurance minimum regulations should be kept in place, but the NTSB should be relieved of its crash investigation functions. Instead, new regulations should replace the current investigative



functions, mandating that insurers investigate their own insureds' crashes. The mandated investigations could be as broad or broader than those required by the present regulations, but the power would be vested in insurance companies. The only requirement would be that the investigators reveal the probable cause of the accident to the NTSB.

Once the information resided in the insurers' databases, it would naturally lend itself to more aggressive risk management programs. By tying premiums and coverage to conditions, the insurers would influence the carriers to act in a safer manner. Of course, this assumes that accident loss savings from better risk management would outweigh the risk management costs, creating a profit motive for insurers. If that were not the case, then government regulations requiring the insurers to create air carrier risk management would even the playing field. When the profit motive fails to accomplish the desired end, government regulation can create the needed incentives.